

**Astoria – East Boat Basin
Breakwater
Sediment Evaluation**

January 30, 2001 Sampling Event

Abstract

The Clean Water Act (CWA) of 1977, as amended regulates dredging activities and requires sediment quality evaluation, including testing, prior to dredging. Guidelines to implement 40 CFR Part 230-Section 404(b)(1) regulations of the CWA, the national (The Inland Testing Manual) (ITM) and the regional (Dredge Material Evaluation Framework for The Lower Columbia River Management Area Dredge Material Evaluation Framework) (DMEF) manuals have adopted a tiered testing approach for the evaluation of dredge material. The Tier IIa (physical testing) and Tier IIb (chemical testing) have been completed for this evaluation. The screening levels (SL) used are those listed in the regional manual.

The January 30, 2001 (the current event) sampling goal was to further characterize the dredging prism associated with sample A-VC-03, collected May 4, 1999, which contained 0.336 ug/L TBT. To accomplish the goal six (6) vibra core samples were collected, one (1) at A-VC-03 coordinates and at two (2) additional sites on each side of this sample, to isolate the extent of contamination. Sufficient sample volume for bioassay and bioaccumulation analyses was collected and sent to the laboratory, with analyses scheduled to follow chemical results. One (1) additional sample was collected at a previously clean site to be used as a reference sample. No DMEF screening levels were exceeded in the chemical analyses from this (January 30, 2001) sampling event. Because of the more intense number of samples within this small area, January 30, 2001 results give a more accurate characterization of material within this dredging prism than the single sample previously taken. This most recent sampling event did not confirm the existence of TBT detected in the May 4, 1999 sample A-VC-03. With the consideration of the “weighted” results of the current sampling event, it is likely that the TBT exceeding the DMEF screening level was an isolated occurrence and not characteristic of the dredging prism. The planned bioassays or bioaccumulation analyses were not conducted. The sediment represented by this sampling event is determined to be acceptable for open, inwater disposal without further characterization.

Introduction

This report will characterize the sediment of the Astoria East Boat Basin associated with and surrounding the sample (A-VC-03, 0.336 ug/L), collected May 4, 1999, which exceeded the DMEF screening level (0.15 ug/L) for TBT. The project description, site history and assessment are detailed in section 1 of the SAP (attached). The sampling and analysis objectives listed below are those stated in the (SAP) (sec. 2.0). This report will outline the procedures used to accomplish these goals.

SAMPLING AND ANALYSIS OBJECTIVES

The sediment characterization program objectives and constraints are summarized below.

- To characterize sediments in accordance with the regional dredge material testing manual, the Dredge Material Evaluation Framework (DMEF) for the Lower Columbia River Management Area.
- Collect, handle and analyze representative sediment core samples, of the purposed dredging prism, and the newly exposed surface, in accordance with protocols and Quality Assurance/Quality Control (QA/QC) requirements.
- Characterize sediments to be dredged for evaluation of environmental impact.
- Conduct physical and chemical characterization, while collecting enough sample volume for further bioassay and bioaccumulation characterization, if needed, to determine disposal methods.

Historical Data (Tier I)

Four sediment samples were taken December 7, 1993 at the Port of Astoria East Mooring Basin and tested for metals, pesticides, polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons (PAHs). All the samples showed low levels for two (2) or more PAHs. All the samples contained some of the butyltin (by bulk analysis) compounds. All samples contained metals at low levels except for the number 01 sample, which had several metals (As, Pb, Cu) at higher levels. This sample was taken outside of the area to be dredged, however. All samples taken from the area to be dredged were well below the screening levels established in the DMEF manual.

In January 1994 permit maintenance dredging took place within the breakwater area to maintain adequate depth for commercial fishing vessels. Prior to dredging sediment quality samples were taken and submitted for analysis and the material found suitable for inwater disposal.

On April 27, 1998, as part of Phase I of the breakwater reconstruction project, five (5) core samples and three (3) surface grab samples were taken at the East End of the breakwater structure (Figure 1). All samples were submitted for physical and chemical analyses. DDT was found to be in excess of the 6.9 ug/kg SL of the DMEF manual. Both the upper 4' and lower 4', of the core, analyses for DDT exceeded the SL. The analysis for the upper 4' core sample showed the DDT level to be 9.7 ug/kg. The lower 4' core sample showed 7.0 ug/kg DDT in the sample. As a result of these analyses additional sediment was collected on June 30, 1998 and submitted for biological analyses. During sampling a sheen was evident in one sample and was submitted for semi-volatile (PAH) analyses. The results of the semi-volatile analysis indicated PAHs in excess of the SL. The bioassay analyses failed as a result of sediment larval normalization (see page 9-7 of the DMEF for a description of normalization)

combined mortality and abnormality exceeding 30% of the reference and showed statistical significant response relative to the reference sediment. The dredge material was disposed of upland at a permitted facility.

The Corps of Engineers, Portland District personnel during Phase II of the breakwater construction project, collected 6 vibra-core samples and 5 surface grab samples on May 4, 1999. The samples were classified as, silty sand to silt. The mean grain size of all samples was 0.70mm. All samples were submitted for physical and chemical analyses, to include, 9 inorganic metals, total organic carbon (TOC), pesticides/polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), phenols and phthalates. A composite from four sampling stations (A-VC-03 through A-VC-06), located inside the boat basin was analyzed for organotin (interstitial water method). All analyses except the organotin (TBT) were below SLs. The composite sample TBT analysis exceeded the SL of 0.15 ug/L with a 0.748 ug/L level. As a result, follow-up TBT analyses were run on all sediment samples collected. These follow-up analyses isolated the TBT, above the SL, to be 0.336 ppb in the A-VC-03 sample. This sample is bracketed on the east by sample A-VC-04 and on the west by sample A-VC-01, both of which did not exceed the DMEF screening level. The May 4, 1999 sampling event included sampling for future, Phase III construction, which includes sample A-VC-03. All sediments removed in Phase II of the construction were determined suitable for open inwater placement.

Current Sampling Discussion

The sampling goal of the current sampling event (January 30, 2001) was to further characterize the dredging prism associated with sample A-VC-03, collected May 4, 1999, which contained 0.336 ug/L TBT. To accomplish the goal six (6) vibra core samples were collected, one (1) at A-VC-03 coordinates and at two (2) additional sites on each side of this sample, to isolate the extent of contamination. One (1) additional sample was collected at a previously clean site to be used as a reference sample. All samples were submitted for physical and chemical analyses, to include, 9 inorganic metals, total organic carbon (TOC), pesticides/polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), phenols, phthalates, misc. extractables, as well as, organotin (interstitial water method). Sufficient sample volume for bioassay and bioaccumulation analyses was collected and sent to the laboratory, with analyses scheduled to follow chemical results. No DMEF screening levels were exceeded in the chemical analyses from this (January 30, 2001) sampling event. Because of the more intense number of samples collected from within this small area, results give a more accurate analysis of conditions within this dredging prism than the single sample previously taken. This most recent sampling event did not confirm the existence of TBT detected in the May 4, 1999 sample A-VC-03. With the consideration of the “weighted” results of the current sampling event, it is likely that the TBT exceeding the DMEF screening level was an isolated occurrence and not characteristic of the dredging prism. The planned bioassays or bioaccumulation analyses were not conducted

Methods for January 30, 2001 Sampling Event.

Physical Analyses: Data for these analyses are presented in Table 1.

All of the six (6) samples submitted for physical analyses exceeded 20% fines and were submitted for chemical analysis. Median grain size for the samples is 0.05mm, with an average of 20.8 % sand and 54.2 % fines. One (1) of the six (6) samples exceeded 5% volatile solids, but were all classified as sandy silt.

Metals, Total Organic Carbon (TOC): Data for these analyses are presented in Table 2. Six (6) samples were submitted for analyses. All inorganic metals were less than the SLs. The highest level detected was Mercury at 49% of the screening level.

Organotin (Total TBT): Data for these analyses are presented in Table 3. All six (6) samples collected were submitted for pore water TBT analyses. The DMEF screening level (SL) of 0.15 ug/L was not exceeded in any of the samples tested. Only one (1) sample, AEB-VC-02, contained any TBT above the method detection limit of 0.0028 to 0.0044 ug/l with Monobutyltin at 0.011ug/l (7% of the SL).

Pesticide/PCBs: All data results for both pesticides and polychlorinated biphenyls PCBs were non-detect at the method detection limit (MDL) and practical quantitation limit (PQL). The non-detect is noted as part of Table 4. The PQLs are well below the screening levels adopted for evaluation of dredge material in the DMEF.

Phenols, Phthalates, Chlorinated Organic Compounds and Extractables: Data for these compounds are presented in Table 4. (Only compounds that were detected are listed). All compounds listed were detected at low levels in some samples. The highest level detected of all these compounds is only 11% of the DMEF screening level (SL).

Polynuclear Aromatic Hydrocarbons (PAHs): Data for PAHs are presented in Tables 5 & 6. Both low and high density PAHs were detected at low levels in all of the samples submitted on May 4th, but none approached the screening level (SL). The highest individual levels of a PAH compounds (benzo(g,h,i)perylene & Indeno(1,2,3-cd)pyrene) detected were 7% of their respective SL.

Conclusion

Collection and evaluation of the sediment data was completed using guidelines from the Dredge Material Evaluation Framework for the Lower Columbia River Management Area (DMEF). The DMEF is a regional manual developed jointly with regional EPA, Corps, Oregon Dept. of Environmental Quality and Washington Depts. of Ecology and Natural Resources. This document is a guideline for implementing the Clean Water Act, 40 CFR 230 sec 404 (b)(1). The screening levels used are those adopted for use in the DMEF, final November 1998.

The present (January 30, 2001) sampling goal was to confirm and isolate the area that indicated TBT results in excess of the DMEF screening level of 0.15 ug/L TBT from the May 4, 1999 sampling event (A-VC-03, 0.336 ug/L TBT) and run bioassay samples as necessary to determine disposal methods. Six (6) vibra core samples were collected, with one (1) at the same location as A-VC-03 and two (2) samples from each side of A-VC-03. One (1) additional sample station was collected as a reference. Because of the more intense number of

samples (five) within this small area, the current sampling event results give a more accurate characterization of the material within this dredging prism. With the consideration of the “weighted” results of January 30, 2001, it is likely that the TBT exceeding DMEF screening levels from the May 4, 1999 sampling event was an isolated occurrence and not characteristic of the dredging prism. The Regional Management Team* (RMT), assembled as a provision of the DMEF for providing professional judgement to apply to such cases, were consulted and concurred with this determination. Tier III bioassay and bioaccumulation testing was not conducted.

The January 30, 2001 sampling event, in conjunction with the results of the May 4, 1999 sampling event, completes the characterization of all sediment associated with the construction project to complete the balance of the breakwater structure at the East Boat Basin at the Port of Astoria. The sediments represented by these sampling events have been determined to be acceptable for open, inwater disposal without further characterization.

References

1. Percy, K.L., Bella, D.A., Sutterlin, C., Klingeman, P.C. 1974. Descriptions and information Sources for Oregon Estuaries. Sea Grant College Program, Oregon State University.
2. Navigation Branch, Operations Division, U. S. Army Corps of Engineers, Portland District. September 1991. Federal Navigation Projects: Columbia River Maintenance Disposal Plan. (Prepared by Mandaville Associates, 600 S. W. Tenth #418, Portland, Oregon 92205)
3. U.S. Army Corps of Engineers, Portland District, Seattle District, U.S. Environmental Protection Agency, Region 10, Oregon Department of Environmental Quality, Washington State Department of Natural Resources. April 1998 (draft document). Dredge Material Evaluation Framework for the Lower Columbia River Management Area.
4. U.S. Army Corps of Engineers, Portland District. 1987. Astoria Deep Draft Summary of Existing Data, Portland, Oregon.
5. Sherman, T.J. 1998. U.S. Army Corps of Engineers, Portland District. Astoria East Boat Basin Sediment Evaluation, Phase I.
6. Sherman, T.J. 1999. U.S. Army Corps of Engineers, Portland District. Astoria East Boat Basin Phase II, Sampling and Analysis Plan.

Physical Analytical

Sample I.D.	Grain Size (mm)				%					
	Median		Mean		Gravel	Sand	Silt/Clay	Volatile solids		
AEB-VC-01	0.06		0.05		0.00	36.51	63.49		3.09	
AEB-VC-02	0.04		0.05		0.00	34.38	65.62		2.90	
AEB-VC-03	0.05		0.06		0.00	40.51	59.49		3.03	
AEB-VC-04	0.05		0.06		0.00	44.84	55.16		5.16	
AEB-VC-05	0.04		0.04		0.00	20.83	79.17		3.73	
AEB-VC-06	0.05		0.06		0.00	44.46	55.54		3.06	
AEB-VC-06 DUP	0.05		0.06		0.00	45.80	54.20		3.10	
Mean	0.050		0.05		0.00	37.03	62.97		3.50	
Minimum	0.04		0.04		0.00	20.83	54.20		2.90	
Maximum	0.06		0.06		0.00	44.84	79.17		5.16	

Inorganic Metals and TOC

Sample I.D.	As	Sb	Cd	Cu	Pb	Hg	Ni	Ag	Zn	TOC
	mg/kg									mg/kg
AEB-VC-01	3.7	0.5	1.2	26	13	0.14	17	0.20	130	5400
AEB-VC-02	5.3	2.0	1.6	29	21	0.19	20	0.25	140	7600
AEB-VC-03	5.5	1.6	1.6	41	21	0.12	18	0.21	150	7200
AEB-VC-04	5.4	1.3	1.5	40	14	0.08	18	0.30	110	12000
AEB-VC-05	4.0	1.6	1.3	25	22	0.20	17	0.22	120	5600
AEB-VC-06	3.5	0.8	1.0	35	12	0.07	15	0.16	90	8300
Screening level (SL)	57	150	5.1	390	450	0.41	140	6.1	410	
Mean	4.6	1.3	1.4	24	17	0.13	18	0.22	123	
Maximum	5.5	2.0	1.6	41	22	0.20	20	0.30	150	
Symbol (<) = Non-detect at the value listed (Method Detection Limit)										

Organotin

Sample ID		Tetrabutyltin	Tributyltin	Dibutyltin	Monobutyltin		Total TBT
Ug/L (ppb)							
AEB-VC-01		<0.0030	<0.0042	<0.0030	<0.0028		ND
AEB-VC-02		<0.0031	<0.0044	<0.0031	0.011		0.011
AEB-VC-03		<0.0031	<0.0044	<0.0031	<0.0030		ND
AEB-VC-04		<0.0031	<0.0044	<0.0031	<0.0030		ND
AEB-VC-05		<0.0030	<0.0042	<0.0030	<0.0028		ND
AEB-VC-06		<0.0031	<0.0044	<0.0031	<0.0030		ND
Screening level (SL)		+	+	+	+	=	0.15
TBT = Total organotin (interstitial water).							
Symbol (<) = Non-detect at the value listed (Method Detection Limit).							

Pesticides/PCBs, Phenols, Phthalates, Chlorinated Organic Compounds and Extractables

Sample I.D.	Phenols		Phthalates					Extractables		
	ug/kg (ppb)									
	Phenol	3-&4- Methyl phenol	Di-n-octyl phthalate	bis(2-Ethylhexyl) phthalate	Butylbenzyl phthalate	Diethyl phthalate	Di-n-butyl phthalate	Benzoic Acid	Benzyl Alcohol	Dibenzofuran
AEB-VC-01	<4.5	8.8 J	<2.4	31	<1.7	9.8 J B1	25 B1	<1.2	4.1 J	3.1 J
AEB-VC-02	<4.5	74	<2.4	50	<1.7	5.7 J B1	29 B1	13	<3.5	<2.0
AEB-VC-03	<4.5	22	<2.4	57	4.9 J	5.8 J B1	26 B1	7.4 J	4.7 J	<2.0
AEB-VC-04	12	59	<2.4	21	2.7 J	7.6 J B1	32 B1	<1.2	3.5 J	<2.0
AEB-VC-05	4.0 J	19	<2.4	50	<1.7	6.9 J B1	31 B1	<1.2	<3.5	<2.0
AEB-VC-06	<3.7	27	4.8 J	300 B2	<1.7	5.0 J B1	23 B1	<1.2	<3.5	4.0
Screening level (SL)	420	670	6200	8300	970	1200	5100	650	57	540
Mean	<4	35	<2.5	85	<1.7	6.8	28	<3.4	<3.5	<2.0
Maximum	12	74	4.8	300	4.9	9.8	32	13	4.7	4.0

Chlorinated Pesticides = Non-detect (ND) at MDL <2.4 ppb, (SL = 6.9ppb).

PCBs = Non-detect <14.0 ppb, (SL = 130 ppb).

*J = Estimated value (reported values are above the MDL, but below the PQL).

*B1 = Low level contamination was present in the method blank, analytical result is < 10 times blank concentration.

*B2 = Low level contamination was present in the method blank, analytical result is > 10 times blank concentration.

Symbol (<) = Non-detect at the value listed (Method Detection Limit).

Polynuclear Aromatic Hydrocarbons (PAHs)
Low Molecular Weight Analytes
ug/kg (ppb)

Sample I.D.	Acenaphthene	Acenaphthylene	Anthracene	Fluorene	2-Methylnaphthalene	Naphthalene	Phenanthrene	Total Low PAHs
AEB-VC-01	5.1	13	7.4	7.8	2.3	2.9	45	83.5
AEB-VC-02	6.1	36	14	8.3	4.4	11	33	112.8
AEB-VC-03	13	9.1	18	7.9	<1.5	8.4	80	136.4
AEB-VC-04	<0.87	13	3.9	<1.0	<1.5	3.8	7.9	28.6
AEB-VC-05	<0.74	4.6	2.7	<0.85	2.9	<2.0	6.9	17.1
AEB-VC-06	24	11	40	29	12	19	230	365
Screening level	500	560	960	540	670	2100	1500	5200
Mean	8.0	12.5	14.3	8.8	3.6	7.5	67.1	
Maximum	24	36	40	29	12	19	230	

Symbol (<) = Non-detect at the value listed (Method Detection Limit)

Polynuclear Aromatic Hydrocarbons (PAHs)
High Molecular Weight Analytes
ug/kg (ppb)

Sample I.D.	Benzo(a)anthracene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Pyrene	Benzo(a)pyrene	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene	Fluoranthene	Total High PAHs
AEB-VC-01	23	33	17	25	36	55	40	<0.48	24	46	664
AEB-VC-02	57	98	37	94	89	100	130	<0.51	82	63	750
AEB-VC-03	45	66	57	44	53	94	66	<0.54	43	86	554
AEB-VC-04	26	49	23	47	30	52	57	<0.58	38	38	360
AEB-VC-05	9.6	7.1	<0.7	14	14	15	15	<0.49	<0.78	9.8	85
AEB-VC-06	71	77	40	60	110	220	110	<0.47	44	120	852
Screening level	1300	3200		670	1400	2600	1600	230	600	1700	12000
Mean											
Maximum											
<p>Symbol (<) = Non-detect at the value listed (Method Detection Limit)</p>											

Figure 1

Port of Astoria, East Boat Basin

